Project Title: **Closed Loop Short Rotation Woody Biomass Energy Crops**

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Contract Number: **DE-FG36-08GO88058**
Project Start Date: **09/01/2008**
Project End Date: **10/31/2013**

Notice: The following is a compilation of Quarterly Progress Reports submitted to the Department of Energy's Office of Energy Efficiency BioEnergy Technologies Office (BETO) by CRC Development, Inc. for award# DE-FG36-08GO88058. The reports cover the project activities from September 1, 2008 to October 31, 2013 and has been uploaded to OSTI by DOE as a substitute for the required Final Technical Report which was never received by DOE from the project recipient.

# CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS
## PROJECT MANAGMENT CENTER REPORT
## PROGRESS REPORT

AWARD NUMBER: DE-FG36-08GO88058
SUBMITTED BY AWARDY: CRC DEVELOPMENT
April 30, 2009

**Executive Summary**

In summer 2008 CRC Development (CRC) leased 600 acres of farm land for commercial hybrid willow installation. Of the 600 acres, 471 acres were actual field acres and 427.5 acres were planted. Total cost of planting was $709,737.41 or $1660.20 per planted acre. Compared to the SUNY-ESF academically estimated cost of $1000/acre this represent a 60% + increase.

Notwithstanding the significantly higher expected cost, the 2008 planting was a partial success. The Planting Team encountered a number of obstacles that provided important lessons learned from the challenges. Field preparation was complicated by unseasonable wet weather, and a twenty-five year lapse of cultivation in many of the fields. These conditions required the use of a large-tracked tractor in order to accomplish field preparation. This tractor requirement increased site preparation cost over forecast budget and calls for closer examination versus cost of the viability of the touted utility of "abandon and under-utilized farmland" for commercial willow. The above average precipitation also caused the team to delay the planting of some of the rented acres until 2009, and increased the cost of weed control. Planting was further hindered by many sole NYS-licensed nursery provided cuttings (AA Willow, the sole Research Foundation of New York licensed willow nursery) that where either oversized or undersized.

Above average precipitation aided cutting sprout development and the initial plant density surveys conducted by SUNY ESF shortly after sprouting indicated that many fields met the goal of 5000 live plants per acre or more. However, as the summer progressed competing weeds took advantage of the abundant moisture and grew well and competed with the willow cuttings. Weed control was hampered by saturated soil conditions, delaying effective herbicide application. By the end of the growing season, when SUNY ESF completed a second assessment, plant density had significantly declined.

CRC plans to interplant the existing plantations during the spring of 2009 to increase plant density to desired levels. The existing plants will be coppiced and the team will aggressively manage weeds in order to ensure the successful maturation of the planted acres.

As a result of the challenges encountered in 2008 CRC and the planting team have implemented a number of initiatives to improve cost and productivity of future planting efforts:

- A comprehensive, enforced cutting specification to improve planting efficiencies.
- Agricultural Development Services (ADS) and CRC have taken steps to have a new equipment suite operational by the spring of 2009 enabling more affective and timely herbicide application under wet soil conditions.
- The team will experiment with zone till cultivation methods in an effort to reduce site preparation costs.

**Plantation Locations**

| Land Owner | Total Acres | County | Town |
|---|---|---|---|
| Edgewood | 110 | Livingston | Groveland |
| Patterson | 95 | Cayuga | Aurelius |
| Bush | 38 | Lewis | Pinckney |
| Agens | 48 | Oneida | Ava |
| Croniser | 30 | Lewis | Leyden |
| West Branch | 185 | Oneida | Lee |

# Work Completed To Date

**Land Lease & Acquisition**

In conjunction with ADS, over 600 acres of property was secured through numerous leases. Through the winter and early spring met with potential land owners to evaluate land for potential willow production. Landowner contacts were made by several methods including public meetings, newspaper advertising, word of mouth, cold calling and third party referrals. Factors evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate. On acceptable acreage, leases were obtained at a fair market rental rate for similar type land. Leases were finalized in the spring of 2008. These leases enable the team access to the properties for the duration of the trial and subsequent growing seasons as desired.

**Planting Procedure**

*Site Prep*

While field conditions varied across the state the site prep on most sites consisted of the following components:

- Fields where mowed with a brush hog to mechanically remove brush and tall grass.

- After the grass and weeds started to grow last spring the fields where treated with herbicide in order to kill all competing vegetation.
- Lime was applied as required in order to increase the ph of the soils.
- Fields where plowed using a mold bar plow in order to turn soils completely over that had been long idle.
- Rocks had to be picked from the fields using hand labor.
- Fields where disks to fracture the soil sufficiently to ensure cutting development.

*Planting*

A planting plan was developed for each location by selecting available willow varieties from three different diversity groups. Planting stock was picked up at the nursery and loaded into a refrigerated truck for transport to the field and for storage during planting. Clones were planted at a population of 6500-6600 clones per acre and a length of 7-8". Fields were block planted by variety and accordingly marked. Field maps were developed showing field location, shape and in-field location of varieties. All fields were GPS mapped to determine actual acreage of planted material and total acreage in a field.

Planting was accomplished using a "Step Planter". This planter was chosen since it gives the cutting the best contact with loose fractured soil, thus the best chance to put out roots and develop. Planting was quite hindered by undersized cuttings that jammed the planter and caused skips from one to several plants, and oversized cuttings that simply could not be run through the planter. Since encountering these problems the team has developed a comprehensive cutting specification to be used for all future cutting acquisition.

**Post Planting**

*Scouting*
ADS, Dr. John Gilliland (Rural Generation Ltd.), SUNY ESF, and CRC monitored the fields to assess planter function and efficiency, cutting development, potential pest and disease issues, plant densities and weed competition. The fields where regularly visited, potential issues were communicated to Team and actions taken as conditions required.

*Weed Control*

As the summer progressed it became apparent to the Team that weeds where beginning to threaten the survival of plants in some fields. Attempts were made to control the weeds using existing agricultural pesticide applicators with appropriate herbicides; however the wet conditions prevented timely application and thus effective control on some fields. CRC and ADS have since been working to resolve this issue and plan to have a tracked, low soil impact, herbicide application system that will enable more timely herbicide application in place by the summer 2009 growing season.

*Stand Densities*

At dormancy, SUNY-ESF conducted field assessments to evaluate stands and individual variety growth, performance and vigor. Coppicing was started on fields where SUNY-ESF had finished their assessment. A report of findings will be made available as soon as the SUNY ESF report is delivered.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

***Coppicing***

ADS has successfully coppiced approximately 110 acres to date and plans to continue coppicing through the spring until bud-break. Any remaining acres left after this season will be coppiced next fall and the spring of 2010.

**2008 COSTS**

| **Item** | **Cost** |
|---|---|
| | |
| Land Rent | $28,030.00 |
| Soil Tests and Mapping | $2,390.00 |
| Lime | $24,406.60 |
| Improvements | $2,520.00 |
| Pre-Plant Spray | $21,138.62 |
| Tillage | $56,646.84 |
| Planting | $29,969.57 |
| Truck Rental | $7,667.68 |
| Truck Fuel | $3,731.56 |
| Equipment Hauling | $10,512.50 |
| Repairs | $14,098.63 |
| Planting Labor | $30,471.75 |
| Field Management | $15,581.45 |
| Lodging and Meals | $11,015.41 |
| Mileage | $1606.05 |
| Other | $84.63 |
| Scouting | $17,850.00 |
| Post Plant Spray | $14,016.12 |
| Cuttings | $418,000.00 |
| | |
| **Total** | $709,737.41 |

# Annual Work Plan FY 2009

The primary activities for 2009 are to coppice fields, continue to manage fields for weeds and pests and improve establishment where possible.

The Team will assess acreage for vitality and supervise for "fill-in" as required. Team will conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, fertilization, data collection and yield projections.

A summary of specific efforts include:

- Walk fields with planting crew in March-April 2009 and re-plant as needed.
- Treat all fields with soil applied pre-emergent herbicides as soon as ground conditions allow for travel in the spring. The specific herbicides and rates used could vary from field to field depending upon weed species present and determinations of herbicides that are suitable for use (crop injury potential vs. efficiency on weeds)
- Apply additional amendments to increase soil pH. Either wood ash or ground limestone could be applied.
- Apply other nutrients to improve soil fertility (potassium and phosphorus). Either wood ash, organic waste products or commercial fertilizer could be applied.
- Monitor fields utilizing integrated pest management protocols. Treat fields with insect/disease out breaks and weed escapes as warranted.

In addition, the team is evaluating specialized equipment needs to perform the above tasks more costs effectively, including:

- Either ATV or small utility tractor which will provide the floatation to allow travel on very wet fields.
- Sprayer to attach to ATV to allow for herbicide applications in wet field conditions
- Wood Ash Spreader
- Shielded sprayer (may not be needed if the ATV sprayer proves to be an effective option)
- Floatation tires for tractor (may not be needed if the ATV sprayer proves to be an effective option)

**Conclusion**

Despite a number of challenges that the planting team encountered, the majority of the fields planted are successfully established commercial plantations, and will be further enhanced by inter-planting this spring. Plans are in place to more effectively control weeds using a new sprayer equipment system. By the end of the 2009 growing season the majority of the fields planted will be well established, high- yield potential, hybrid willow plantations.

# CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS
## PROJECT MANAGMENT CENTER REPORT
## PROGRESS REPORT

AWARD NUMBER: DE-FG36-08GO88058
SUBMITTED BY AWARDEE: CRC DEVELOPMENT
July 31, 2009

**Summary 2008**

In the summer of 2008 CRC Development LLC (CRC) leased 600 acres of farm land for the planting of hybrid willow. 427.5 acres were planted at a total cost of $848,793 or $1,985 per planted acre ($665,460 or $1,556.63 per planted acre were qualifying expenses). When compared to the targeted cost of $1000/acre this represent a 56% increase.

Despite the higher than expected cost, the 2008 planting is assessed to be a partial success. The planting team encountered a number of obstacles that provided lessons learned as well as challenges. Field preparation was complicated by unseasonable wet weather, and a twenty five year cultivation lapses on many fields. These conditions required the use of a large tracked tractor for field preparation. This un-forecast cost substantially increased site preparation costs over programmed budget. The above average precipitation also caused the team to delay the planting of some of the leased acres until 2009 or beyond and thereby increased the cost of weed control. Planting was further hindered by vendor delivered planting stock cuttings that where over- and under-sized and otherwise not to standard specification.

The above average precipitation aided cutting sprout development and the initial plant density surveys conducted by SUNY-ESF shortly after sprouting indicated that many fields met the goal of 5000 or more live plants per acre. However, as the summer progressed competing weeds took advantage of the abundant moisture and grew vigorously and sharply competed with the seedlings. Weed control was hampered by saturated soil conditions, delaying effective herbicide application. By the end of the growing season, when SUNY-ESF completed a second assessment, surviving plant density had significantly declined.

Looking forward CRC made plans to interplant the existing plantations during the spring of 2009 increasing plant density to desired levels. This effort is discussed below. The existing plants were to be coppiced and an aggressive weed-management strategy deployed in order to ensure the successful establishment of all planted acres.

As a result of the challenges encountered in 2008 CRC and the planting team have implemented a number of initiatives to improve cost and productivity of future planting efforts:

- Comprehensive cutting specification to improve planting efficiencies.
- Agricultural Development Services (ADS) and CRC have taken steps to have a new equipment spread in place by the spring of 2009 enabling more affective and timely herbicide application under wet soil conditions.
- Test and evaluation of a zone till cultivation methods in an effort to reduce sit preparation costs.

**Plantation Locations**

| Land Owner | Total Acres | County | Town |
|---|---|---|---|
| Edgewood | 110 | Livingston | Groveland |
| Patterson | 95 | Cayuga | Aurelius |
| Bush | 38 | Lewis | Pinckney |
| Agens | 48 | Oneida | Ava |
| Croniser | 30 | Lewis | Leyden |
| West Branch | 185 | Oneida | Lee |

# Work Completed in 2008

**Land Lease & Acquisition**

In conjunction with ADS, over 600-acres of property was secured through various lease agreements. Through the winter and early spring they met with potential land owners to evaluate land for potential willow production. Landowner contacts were made by several methods including public meetings, newspaper advertising, word of mouth, cold calling and third party referrals. Factors evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate. On acceptable acreage, leases were obtained at a fair market rental rate for similar type land. These were finalized in the spring of 2008. These leases enable the team access to the properties for the duration of the trial and subsequent growing seasons as desired.

**Planting Procedure**

*Site Preparation*

While field conditions varied across the state the site preparation on most sites consisted of the following components:

- Fields where mowed with a brush hog to mechanically remove brush and tall grass.

- After the grass and weeds started to grow last spring the fields where treated with herbicide in order to kill all competing vegetation.
- Lime was applied as required in order to increase the ph of the soils.
- Fields where plowed using a mold bar plow in order to turn soils that had been long idle. completely over.
- Rocks were picked from the fields using hand labor.
- Fields were disked to fracture the soil sufficiently to ensure cutting development.

*Planting*

A planting plan was developed for each location by selecting available willow varieties from three different diversity groups. Planting stock was picked up at the nursery and loaded into a refrigerated truck for transport to the field and for storage during planting. Clones were planted at a population of 6500-6600 clones per acre and a length of 7-8". Fields were block planted by variety and marked accordingly. Field maps were developed showing field location, shape and in-field location of varieties. All fields were GPS mapped to determine actual acreage of planted material and total acreage in a field.

Planting was accomplished using a step planter. The step planter was developed in Europe and is designed to push individual 8" willow cuttings into the freshly cultivated soil. This planter was chosen since it gives the cutting the best contact with loose fractured soil, thus the best chance to put out roots and develop. Planting was hindered by undersized, not-to-standard-specification cuttings. We now assess these cuttings resulted from drought conditions at the nursery during 2007. These undersized cutting jammed the planter and caused skips of one to several plants. Equally, there were issues with not-to-standard-specification oversized cuttings that did not fit planter. The team has developed a more rigorous and comprehensive cutting specification for future cutting acquisition.

**Post Planting**

*Scouting*

ADS, Dr. John Gilliland, SUNY-ESF, and CRC all monitored the fields to assess planter function and efficiency, cutting development, potential pest and disease issues, plant densities and weed competition. The fields where regularly visited and potential issues communicated to the team and actions taken as conditions warranted.

*Weed Control*

As the summer progressed it became apparent to the team that weeds where beginning to threaten the survival of plants in some fields. Attempts were made to control the weeds using existing agricultural pesticide applicators with appropriate herbicides; however the wet conditions prevented timely application and thus effective control on some fields. CRC and ADS have since been working to resolve this issue and plan to have a tracked, low soil impact, herbicide application system that will enable timelier herbicide application in place by the summer 2009 growing season.

*Stand Densities*

At dormancy, SUNY-ESF conducted field assessments to evaluate stands and individual variety growth, performance and vigor. Coppicing was started on fields where SUNY-ESF had finished their assessment.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

***Coppicing***

ADS has successfully coppiced approximately 110 acres as of the writing of this report and plans to continue coppicing through the spring until bud-break. Any remaining acres left after this season will be coppiced next fall and the spring of 2010.

**2008 Financials**

The total 2008 expenditures for the establishment of willow, land rent, cultivation, planting and maintenance was $665,460.00.

# Annual Work Plan FY 2009

The primary activities for 2009 include coppicing fields, management of fields for weeds and pests and improved stand establishment. The team will assess acreage for vitality and supervise for "fill-in" as required. We will conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, fertilization, data collection and yield projections.

A summary of specific efforts include:

- Walk fields with planting crew in March-April 2009 and re-plant as needed.
- Treat all fields with soil applied pre-emergent herbicides as soon as ground conditions allow for travel in the spring. The specific herbicides and rates used could vary from field to field depending upon weed species present and determinations of herbicides that are suitable for use (crop injury potential vs. efficacy on weeds)
- Apply additional amendments to increase soil pH. Either wood ash or ground limestone could be applied.
- Apply other nutrients to improve soil fertility (potassium and phosphorus). Either wood ash, organic waste products or commercial fertilizer could be applied.
- Monitor fields utilizing integrated pest management protocols. Treat fields with insect/disease out breaks and weed escapes as warranted.

In addition, the team is evaluating specialized equipment needs to perform the above tasks more costs effectively, including:

- Either ATV or small utility tractor which will provide the floatation to allow travel on very wet fields.
- Sprayer to attach to ATV to allow for herbicide applications in wet field conditions
- Wood Ash Spreader
- Shielded sprayer (may not be needed if the ATV sprayer proves to be an effective option)
- Floatation tires for tractor (may not be needed if the ATV sprayer proves to be an effective option)

**Conclusion**

Notwithstanding 2008 issues, the team is optimistic that the majorities of the fields planted are successfully established plantations, and will be further enhanced by inter-planting. In addition plans are in place to more effectively control weeds using a new sprayer equipment system. We are optimistic that by the end of the 2009 growing season that the majority of the fields planted will be well established, high yielding, hybrid willow plantations.

**2009 Executive Summary**

In the summer of 2008 CRC leased 600-acres of under-utilized farm land for hybrid willow plantations. Of the 427.5 acres planted in 2008, 203 acres were coppiced, and 253 acres inter-planted with 400,000 cuttings in the 2nd quarter of 2009. In addition a new low impact spray system was purchased by a local spray contractor allowing more aggressive weed control on the northern fields.

The team has also decided to conduct a trail using a strip-till method of site preparation on a 20 acre field. The field has been planted using this method and the team will be monitoring the results over the course of the summer.

**Plantation Locations**

| Land Owner | Total Acres | Planted Acres | Coppiced Acres | Inter-Planted Acres |
|---|---|---|---|---|
| Edgewood | 110 | 90.6 | 90.6 | 90.6 |
| Patterson | 95 | 89.4 | 89.4 | 89.4 |
| Bush | 38 | 33.5 | 0 | 0 |
| Agens | 48 | 43.7 | 0 | 0 |
| Croniser | 30 | 24.2 | 24.2 | 24.2 |
| West Branch | 185 | 171 | 0 | 50 |

# Work Completed To Date

## Coppicing

Coppicing was completed on all the southern (those south of Interstate 90) and one of the northern plantations during the 2nd quarter of 2009. Coppicing was completed by ADS using a cycle bar mower and a tractor. It was determined by the team that several of the Northern Plantations would be allowed to grow another season prior to coppicing in order to:

- Allow the willow to grow another season in an effort to enhance vigor on the last fields planted in 2008.
- Overcome wet spring conditions, which did not allow access to the fields prior to bud break.
- Coordinate coppicing with inter-planting.

## Inter- Planting

Coppiced fields were inter-planted in order to enhance stand density to desired levels. CRC ordered 400,000 willow cuttings 20 inches in length and ¾" inches in diameter of various varieties from Double A Willow in early spring 2009. The willow cuttings were hand planted by crews supervised by ADS. SUNY-ESF acted as an advisor to ADS on planting technique including advising ADS on the size of the gaps to interplant, planting technique and timing. Initial observations indicate that the inter-planting results where favorable on most sites with as high 80% of the cuttings sprouting. A small number of fields at Edgewood did not do as well with only about 50% of the cuttings sprouting; however, if all the live cuttings survive field density will still be adequate to fully use the site yield potential.

## Post Planting

*Scouting*

The team continues to monitor the fields for weed competition, pests, and plant health on a regular basis.

*Weed Control*

For the most part weed control on the southern plantations has been successful and it is believed by the team that the willow will successfully outpace the weeds by summer's end; however weed control continues to be an issue on most of the northern plantations. A local spray contractor has purchased a unit with hi-flotation tracts that has allowed timelier herbicide application, and the team is hopeful that Northern willow will eventually outpace the weeds. In addition the Agronomist from ADS has been working closely with Dr. Larry Smart from Cornell University in regard to known herbicides to address future weed issues.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

## Strip-Till Trial

One of the key learning's from the 2008 planting season was that a substantial part of the establishment cost was due to the high cost of sight preparation on fields that had not been tilled for a number of years. In an effort to reduce cost the team decided to trial a strip-till cultivation method. A 20-acre field was identified by ADS co-located near the existing Edgewood plantation to trial this technique.

The technique involves:

- Killing the existing vegetation using appropriate herbicides.
- Strip-Tilling the site using GPS guided tractors.
- Planting the tilled strips again using GPS guided tractors.

The tilling and planting have been completed on the cuttings have started to sprout, assessments of outcomes are premature.

## 2009 Financials

The total 2009 costs to date for the establishment of willow, land rent, cultivation, strip till planting and maintenance was $291,790.00.

## Going Forward

Most of the major field work for 2009 has been completed; however the team will continue to monitor the fields and conduct routine agricultural practices such as pest control, weed control and soil amendments as required.

At this time the team plans to coppice and inter-plant the remainder of the fields during the winter and spring of 2010.

## Conclusion

The bulk of the acres planted south of Interstate 90 (southern plantations), as well as Croniser Farm in the North, are in good- to-excellent condition. They have been both coppiced and inter-planted. The stands are well stocked and growing well. The willow should easily be over six feet tall by summer's end all of these fields. Therefore, it is reasonable to assume that these acres are established and will produce a biomass crop in three to four years.

While the outlook for the remainder of the Northern fields is not as optimistic as that of the ones already mentioned, primarily due to lower nutrients, shorter growing season, and higher weed pressure, the team is optimistic that the fields can be managed to produce a viable crop. We are encouraged by the ability of the new spray system to deliver material when needed on the wetter

ground, and feel that by summer’s end these fields will be ready to be coppiced and inter-planted.

# CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS
# PROJECT MANAGEMENT CENTER REPORT
# PROGRESS REPORT

AWARD NUMBER: DE-FG36-08GO88058
SUBMITTED BY AWARDY: CRC DEVELOPMENT
3rd Quarter 2009
October 30, 2009

## Summary 2008

In the summer of 2008 CRC Development (CRC) rented 600 acres of farm land for the planting of hybrid willow. 427.5 acres were planted at a total cost of $848,793 or $1,985 per planted acre ($665,460 or $1,556.63 per planted acre were qualifying expenses). When compared to the targeted cost of $1000/acre this represent a 56% increase.

Despite the higher than expected cost, the 2008 planting is considered at least a partial success by CRC. The planting team encountered a number of obstacles that provided learning opportunities as well as challenges. Field preparation was complicated by extremely wet weather, and a twenty five year laps of cultivation in many of the fields. These conditions required the use of a large tracked tractor in order to accomplish field preparation, thus increasing site prep cost substantially over budget. The above average precipitation also caused the team to delay the planting of some of the rented acres until 2009 or beyond, and increased the cost of weed control. Planting was further hindered by cuttings that where over and undersized.

The above average precipitation aided cutting sprout development and the initial plant density surveys conducted by SUNY CESF shortly after sprouting indicated that many fields met the goal of 5000 live plants per acre or more. However, as the summer progressed competing weeds took advantage of the abundant moisture and grew prolifically thereby competing with the seedlings. Weed control was hampered by saturated soil conditions, delaying effective herbicide application. By the end of the growing season, when SUNY CESF completed a second assessment, plant density had significantly declined.

Looking forward CRC has made plans to interplant the existing plantations during the spring of 2009 increasing plant density to desired levels. The existing plants will be coppiced and the team will aggressively manage weeds in order to ensure the successful establishment of the planted acres.

As a result of the challenges encountered in 2008 CRC and the planting team have implemented a number of initiatives to improve cost and productivity of future planting efforts that include:

- Comprehensive cutting specification to improve planting efficiencies.
- Agricultural Development Services (ADS) and CRC have taken steps to have a new equipment spread in place by the spring of 2009 enabling more affective and timely herbicide application under wet soil conditions.
- The team will experiment with zone till cultivation methods in an effort to reduce sit prep costs.

**Plantation Locations**

| Land Owner | Total Acres | County | Town |
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| Edgewood | 110 | Livingston | Groveland |
| Patterson | 95 | Cayuga | Aurelius |
| Bush | 38 | Lewis | Pinckney |
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# Work Completed in 2008

**Land Lease & Acquisition**

In conjunction with our team partner, ADS, over 600 acres of property was secured through numerous leases. Through the winter and early spring they met with potential land owners to evaluate land for potential willow production. Landowner contacts were made by several methods including public meetings, newspaper advertising, word of mouth, cold calling and third party referrals. Factors evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate. On acceptable acreage, leases were obtained at a fair market rental rate for similar type land. These were finalized in the spring of 2008. These leases enable the team access to the properties for the duration of the trial and subsequent growing seasons as desired.

**Planting Procedure**

*Site Prep*

While field conditions varied across the state the site prep on most sites consisted of the following components:

- Fields where mowed with a brush hog to mechanically remove brush and tall grass.

- After the grass and weeds started to grow last spring the fields where treated with herbicide in order to kill all competing vegetation.
- Lyme was applied as required in order to increase the ph of the soils.
- Fields where plowed using a mold bar plow in order to turn soils completely over that had been long idle.
- Rocks had to be picked from the fields using hand labor.
- Fields where disks to fracture the soil sufficiently to ensure cutting development.

*Planting*

A planting plan was developed for each location by selecting available willow varieties from three different diversity groups. Planting stock was picked up at the nursery and loaded into a refrigerated truck for transport to the field and for storage during planting. Clones were planted at a population of 6500-6600 clones per acre and a length of 7-8". Fields were block planted by variety and marked accordingly. Field maps were developed showing field location, shape and in-field location of varieties. All fields were GPS mapped to determine actual acreage of planted material and total acreage in a field.

Planting was accomplished using a step planter. The step planter was developed in Europe and is designed to push individual 8" willow cuttings into the freshly cultivated soil. This planter was chosen since it gives the cutting the best contact with loose fractured soil, thus the best chance to put out roots and develop. Planting was hindered by undersized cuttings resulting from the drought conditions at the nursery during the 2007 growing season. These undersized cutting jammed the planter and caused skips of one to several plants, and oversized cuttings that simply could not be run through the planter. Since encountering these problems the team has developed a comprehensive cutting specification to be used when cuttings are ordered in the future.

**Post Planting**

*Scouting*

ADS, Dr. John Gilliland, SUNY CESF, and CRC all monitored the fields to assess planter function and efficacy, cutting development, potential pest and disease issues, plant densities and weed competition. The fields where visited on a regular basis, potential issues communicated to Team and actions taken as conditions warranted.

*Weed Control*

As the summer progressed it became apparent to the team that weeds where beginning to threaten the survival of plants in some fields. Attempts were made to control the weeds using existing agricultural pesticide applicators with appropriate herbicides; however the wet conditions prevented timely application and thus effective control on some fields. CRC and ADS have since been working to resolve this issue and plan to have a tracked, low soil impact,

herbicide application system that will enable more timely herbicide application in place by the summer 2009 growing season.

*Stand Densities*

At dormancy, SUNY-ESF conducted field assessments to evaluate stands and individual variety growth, performance and vigor. Coppicing was started on fields where SUNY-ESF had finished their assessment.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

***Coppicing***

ADS has successfully coppiced approximately 110 acres as of the writing of this report and plans to continue coppicing through the spring until bud-break. Any remaining acres left after this season will be coppiced next fall and the spring of 2010.

**2008 Financials**

The total 2008 expenditures for the establishment of willow, land rent, cultivation, planting and maintenance was $665,460.00.

# Annual Work Plan FY 2009

The primary activities for 2009 are to coppice fields, continue to manage fields for weeds and pests and improve establishment where possible. The team will assess acreage for vitality and supervise for "fill-in" as required. We will conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, fertilization, data collection and yield projections.

A summary of specific efforts include:

- Walk fields with planting crew in March-April 2009 and re-plant as needed.
- Treat all fields with soil applied pre-emergent herbicides as soon as ground conditions allow for travel in the spring. The specific herbicides and rates used could vary from field to field depending upon weed species present and determinations of herbicides that are suitable for use (crop injury potential vs. efficacy on weeds)
- Apply additional amendments to increase soil pH. Either wood ash or ground limestone could be applied.
- Apply other nutrients to improve soil fertility (potassium and phosphorus). Either wood ash, organic waste products or commercial fertilizer could be applied.
- Monitor fields utilizing integrated pest management protocols. Treat fields with insect/disease out breaks and weed escapes as warranted.

In addition, the team is evaluating specialized equipment needs to perform the above tasks more costs effectively, including:

- Either ATV or small utility tractor which will provide the floatation to allow travel on very wet fields.
- Sprayer to attach to ATV to allow for herbicide applications in wet field conditions
- Wood Ash Spreader
- Shielded sprayer (may not be needed if the ATV sprayer proves to be an effective option)
- Floatation tires for tractor (may not be needed if the ATV sprayer proves to be an effective option)

**Conclusion**

Despite a number of setbacks that the Planting Team Encountered last summer the Team is optimistic that the majority of the fields planted are successfully established plantations, and will be further enhanced by inter-planting this spring. In addition plans are in place to more effectively control weeds using a new sprayer equipment system. We are optimistic that by the end of the 2009 growing season that the majority of the fields planted will be well established, high yielding, hybrid willow plantations.

**2009 Executive Summary**

In the summer of 2008 CRC rented 600 acres of farm land for the planting of hybrid willow. Of the 427.5 acres planted in 2008, 203 acres have been coppiced, and 253 acres inter-planted with 400,000 cuttings in the 2nd quarter of 2009. In addition a new low impact spray system was purchased by a local spray contractor allowing more aggressive weed control on the northern fields.

The team has also decided to conduct a trail using a strip-till method of site preparation on a 20 acre field. The field has been planted using this method and the team will be monitoring the results over the course of the summer.

**Plantation Locations**

| Land Owner | Total Acres | Planted Acres | Coppiced Acres | Inter-Planted Acres |
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| Patterson | 95 | 89.4 | 89.4 | 89.4 |
| Bush | 38 | 33.5 | 0 | 0 |
| Agens | 48 | 43.7 | 0 | 0 |
| Croniser | 30 | 24.2 | 24.2 | 24.2 |
| West Branch | 185 | 171 | 0 | 50 |

# Work Completed To Date

## Coppicing

Coppicing was completed on all the southern (those south of Interstate 90) and one of the northern plantations during the 2nd quarter of 2009. Coppicing was completed by ADS using a cycle bar mower and a tractor. It was determined by the team that several of the Northern Plantations would be allowed to grow another season prior to coppicing for the following reasons:

- Allow the willow to grow another season in an effort to enhance vigor on the last fields planted in 2008.
- Wet spring conditions would not allow access to the fields prior to bud break.
- Time Coppicing with inter-planting.

## Inter- Planting

Coppiced fields where inter-planted in order to enhance stand density to desired levels. CRC ordered 400,000 willow cuttings 20 inches in length and ¾" inches in diameter of various varieties from Double A Willow in the early spring of 2009. The willow cuttings where hand planted by crews supervised by ADS. SUNY CESF acted as an advisor to ADS on planting

technique including advising ADS on the size of the gaps to interplant, planting technique and timing. Initial observations indicate that the inter-planting results where favorable on most sites with as high 80% of the cuttings sprouting. A small number of fields at Edgewood did not do as well with only about 50% of the cuttings sprouting, however if all the live cuttings survive stocking should still be adequate to utilize the site potential.

**Post Planting**

*Scouting*

The team continues to monitor the fields for weed competition, pests, and plant health on a regular basis.

*Weed Control*

For the most part weed control on the Southern plantations has been successful and it is believed by the team that the willow will successfully outpace the weeds by summer's end, however weed control continues to be an issue on most of the Northern plantations. A local spray contractor has purchased a unit with hi-flotation tracts that has allowed timelier herbicide application, and the team is hopeful that Northern willow will eventually outpace the weeds. In addition the Agronomist from Ag Development Services has been working closely with Dr. Larry Smart from Cornell University to trail knew herbicides to address the weed issue going forward.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

**Strip-Till Trial**

One of the key learning's from the 2008 planting season was that a substantial part of the establishment cost was due to the high cost of sight prep on fields that had not been tilled for a number of years. In an effort to reduce this cost it was decided to trial a strip-till method of cultivating. A 20 acres field was identified by ADS near the existing fields at Edgewood to trial this technique.

The technique involves:

- Killing the existing vegetation using appropriate herbicides.
- Strip-Tilling the site using GPS guided tractors.
- Planting the tilled strips again using GPS guided tractors.

The tilling and planting have been completed on the cuttings have started to sprout, but it has been too soon draw any conclusions from the trial.

### 2009 Financials

The total 2009 costs to date for the establishment of willow, land rent, cultivation, strip till planting and maintenance was $291,790.00.

### Going Forward

Most of the major field work for 2009 has been completed; however the team will continue to monitor the fields and conduct routine agricultural practices such as pest control, weed control and soil amendments as required.

At this time the team plans to coppice and inter-plant the remainder of the fields not done as of yet during the winter and spring of 2010.

### Conclusion

The bulk of the acres planted South of Interstate 90 (southern plantations), as well as Croniser Farm in the North, are in good to excellent condition. They have been both coppiced and inter-planted. The stands are well stocked and growing well. The willow should easily be over six feet tall by summer's end all of these fields. Therefore, it is reasonable to assume that these acres are established and will produce a biomass crop in three to four years.

While the outlook for the remainder of the Northern fields is not as optimistic as that of the ones already mentioned, primarily due to lower nutrients, shorter growing season, and higher weed pressure, the team is optimistic that the fields can be managed to produce a viable crop. We are encouraged by the ability of the new spray system to deliver material when needed on the wetter ground, and feel that by summer's end these fields will be ready to be coppiced and inter-planted.

## Progress Report 3rd Quarter 2009

### Executive Summary

At the time of this report writing the 2009 growing season is drawing to an end providing an opportune time for CRC to evaluate the willow program and stand establishment. While results vary from field to field, across soil types and geography, it is reasonable to conclude that a majority of the acres planted in 2008 have resulted in the establishment of successful hybrid willow plantations. Fields located alone the I90 and I390 experience robust growth with some willow exceeding 12 feet in height. The majorities of the southern plantations have good stocking densities and are on the verge of establishing full crown closure thus eliminating weed

control issues. No immediate actions are required on these fields until harvest in two to three years although regular monitoring and walking will continue.

The condition of the northern fields is more variable. The field at Croniser was coppiced last spring and is comparable to the southern plantations with crown closure anticipated for early next summer. The remaining fields in the north where not coppiced due their poor growth and vigor at the start of the growing season. Over the course of the summer most of these fields, while far behind fields like Croniser, grew significantly and are currently four to six feet tall. The exception is the West Branch plantation which suffers from poor soil nutrient condition, aggressive weed competition and poor soil drainage. This plantation only grew to a height of two to four feet. Despite it's relatively poor condition it is alive, and expectation are, that given enough time, it will exhibit growth similar to the other plantations in the region.

Going forward coppicing is schedule on the remainder of the northern fields, weather permitting, through the fall. All of the coppiced fields will be treated with herbicides and several of the fields with be further treated with lime to continue the process of mitigating the PH of the soil.

**Plantation Condition**

**Strip Till Trial**

Initial sprouting of the cuttings planted in the strip tilled fields was very good. The percentage of the cuttings successfully established was estimated at 80%. A cool, wet spring and early summer ensured the survival of the cuttings that sprouted. Once again weed control was not optimum. Competition from weeds in combination with intense deer browsing hampered growth after sprouting. Despite the setbacks growth was adequate to justify coppicing, and the field is scheduled to be coppiced this winter.

**Edgewood**

The average height of the Edgewood plantations ranges from six to twelve feet. Overall the condition of the fields is good with successful plantation establishment. The majority of the fields will have full crown closure by early summer 2010 and would anticipate a harvest in three to four years. No further activity, excepting exploring nutrient tipping, and monitoring is anticipated.

**Patterson**

The average height of the Edgewood plantations ranges from six to twelve feet. Overall the condition of the fields is good with successful plantation establishment. The majority of the fields will have full crown closure by early summer 2010 and would anticipate a harvest in three

to four years. No further activity, excepting exploring nutrient tipping, and monitoring is anticipated.

**Bush**

The average height of the Bush plantation ranges from three to five feet. Cold, wet early summer and spring weather combined with intense weed pressure hampered growth on this field until late summer when a short period of good weather allowed the plantation to put on significant growth.

The Bush plantain was not coppiced, but is scheduled to be coppiced this fall weather permitting. Coppicing will allow a brief window to apply a wider variety of herbicides to control weeds as well as additional lime. Plans are in place to proceed with additional herbicide and lime applications weather permitting. If treatments are successful and we have a good growing season in 2010 crown closure might be expected by the end of the 2010 growing season.

**Agen**

The average height of the Agen plantations ranges from five to eight feet. Despite intense weed pressure during the summer of 2008 the fields grew surprisingly well over the summer of 2009.

The Agen plantain was not coppiced, but is scheduled to be coppiced this fall weather permitting. Coppicing will allow a brief window to apply a wider variety of herbicides to control weeds as well as additional lime. Plans are in place to proceed with additional herbicide applications weather permitting. If treatments are successful and we have a good growing season in 2010 crown closure might be expected by the end of the 2010 growing season

**Croniser**

Croiniser consist of two distinct fields. The average height of the smaller plantation ranges from three to five feet.

This plantain was not coppiced, but is scheduled to be coppiced this fall weather permitting. Coppicing will allow a brief window to apply a wider variety of herbicides as well as additional lime. Plans are in place to proceed with additional herbicide and lime applications weather permitting. If treatments are successful and we have a good growing season in 2010 crown closure might be expected by the end of the 2010 growing season

The primary field at Croniser has an average height of 10-12 feet and was coppiced last spring.. Overall the condition of the fields is good with successful plantation establishment. The majority of the fields will have full crown closure by early summer 2010 and would anticipate a harvest in three to four years.

**West Branch**

The average height of the West Branch plantations ranges from two to four feet. Cold, wet early spring and early summer weather combined with intense weed pressure and poor soli fertility hampered growth on this field until late summer when a short period of good growing conditions allowed the plantation to put on some growth. Despite the poor growth the willow remains relatively healthy and vigorous

The West Branch plantain was not coppiced to allow for the plants to grow and improve vigor. It has been decided to go ahead with coppicing this fall weather permitting. Coppicing will allow a brief window to apply a wider variety of herbicides to control weeds as well as additional lime. Plans are in place to proceed with additional herbicide applications weather permitting. Under the best of conditions this plantation will not likely achieve full crown closure until the fall of 2011.

**Going Forward**

- Coppice the fields yet to be coppiced and:
    - Apply additional lime as required
    - Apply herbicides as required
- Investigate nutrient application especially at West Branch
- Investigate harvesting technology in anticipation of harvest as early as 2013

**Conclusion**

At the end of the 2009 growing season several viable commercial hybrid willow plantations have been established, with the anticipation of the remaining acres initially planted in 2008 being commercially established by the end of the 2010 growing season.

In addition a number of key learning have taken place concerning the best practices for the commercial propagation of hybrid willow over wide variety of sites, micro climates, and historical field conditions throughout the geography and soil types of New York State.

Going forward there is still a significant learning curve yet to overcome particularly concerning weed control, best tillage practices and the best harvesting technology.

# CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS
## PROJECT MANAGMENT CENTER REPORT
## PROGRESS REPORT

AWARD NUMBER: DE-FG36-08GO88058
SUBMITTED BY AWARD: CRC DEVELOPMENT
4th Quarter 2009
December 31,2009

**Summary 2008**

In the summer of 2008 CRC Development (CRC) rented 600 acres of farm land for the planting of hybrid willow. 427.5 acres were planted at a total cost of $848,793 or $1,985 per planted acre ($665,460 or $1,556.63 per planted acre were qualifying expenses). When compared to the targeted cost of $1000/acre this represent a 56% increase.

Despite the higher than expected cost, the 2008 planting is considered at least a partial success by CRC. The planting team encountered a number of obstacles that provided learning opportunities as well as challenges. Field preparation was complicated by extremely wet weather, and a twenty five year laps of cultivation in many of the fields. These conditions required the use of a large tracked tractor in order to accomplish field preparation, thus increasing site prep cost substantially over budget. The above average precipitation also caused the team to delay the planting of some of the rented acres until 2009 or beyond, and increased the cost of weed control. Planting was further hindered by cuttings that where over and undersized.

The above average precipitation aided cutting sprout development and the initial plant density surveys conducted by SUNY CESF shortly after sprouting indicated that many fields met the goal of 5000 live plants per acre or more. However, as the summer progressed competing weeds took advantage of the abundant moisture and grew prolifically thereby competing with the seedlings. Weed control was hampered by saturated soil conditions, delaying effective herbicide application. By the end of the growing season, when SUNY CESF completed a second assessment, plant density had significantly declined.

Looking forward CRC has made plans to interplant the existing plantations during the spring of 2009 increasing plant density to desired levels. The existing plants will be coppiced and the team will aggressively manage weeds in order to ensure the successful establishment of the planted acres.

As a result of the challenges encountered in 2008 CRC and the planting team have implemented a number of initiatives to improve cost and productivity of future planting efforts that include:

- Comprehensive cutting specification to improve planting efficiencies.
- Agricultural Development Services (ADS) and CRC have taken steps to have a new equipment spread in place by the spring of 2009 enabling more affective and timely herbicide application under wet soil conditions.
- The team will experiment with zone till cultivation methods in an effort to reduce sit prep costs.

**Plantation Locations**

| Land Owner | Total Acres | County | Town |
|---|---|---|---|
| Edgewood | 110 | Livingston | Groveland |
| Patterson | 95 | Cayuga | Aurelius |
| Bush | 38 | Lewis | Pinckney |
| Agens | 48 | Oneida | Ava |
| Croniser | 30 | Lewis | Leyden |
| West Branch | 185 | Oneida | Lee |

# Work Completed in 2008

**Land Lease & Acquisition**

In conjunction with our team partner, ADS, over 600 acres of property was secured through numerous leases. Through the winter and early spring they met with potential land owners to evaluate land for potential willow production. Landowner contacts were made by several methods including public meetings, newspaper advertising, word of mouth, cold calling and third party referrals. Factors evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate. On acceptable acreage, leases were obtained at a fair market rental rate for similar type land. These were finalized in the spring of 2008. These leases enable the team access to the properties for the duration of the trial and subsequent growing seasons as desired.

**Planting Procedure**

*Site Prep*

While field conditions varied across the state the site prep on most sites consisted of the following components:

- Fields where mowed with a brush hog to mechanically remove brush and tall grass.

- After the grass and weeds started to grow last spring the fields where treated with herbicide in order to kill all competing vegetation.
- Lyme was applied as required in order to increase the ph of the soils.
- Fields where plowed using a mold bar plow in order to turn soils completely over that had been long idle.
- Rocks had to be picked from the fields using hand labor.
- Fields where disks to fracture the soil sufficiently to ensure cutting development.

*Planting*

A planting plan was developed for each location by selecting available willow varieties from three different diversity groups. Planting stock was picked up at the nursery and loaded into a refrigerated truck for transport to the field and for storage during planting. Clones were planted at a population of 6500-6600 clones per acre and a length of 7-8". Fields were block planted by variety and marked accordingly. Field maps were developed showing field location, shape and in-field location of varieties. All fields were GPS mapped to determine actual acreage of planted material and total acreage in a field.

Planting was accomplished using a step planter. The step planter was developed in Europe and is designed to push individual 8" willow cuttings into the freshly cultivated soil. This planter was chosen since it gives the cutting the best contact with loose fractured soil, thus the best chance to put out roots and develop. Planting was hindered by undersized cuttings resulting from the drought conditions at the nursery during the 2007 growing season. These undersized cutting jammed the planter and caused skips of one to several plants, and oversized cuttings that simply could not be run through the planter. Since encountering these problems the team has developed a comprehensive cutting specification to be used when cuttings are ordered in the future.

**Post Planting**

*Scouting*

ADS, Dr. John Gilliland, SUNY CESF, and CRC all monitored the fields to assess planter function and efficacy, cutting development, potential pest and disease issues, plant densities and weed competition. The fields where visited on a regular basis, potential issues communicated to Team and actions taken as conditions warranted.

*Weed Control*

As the summer progressed it became apparent to the team that weeds where beginning to threaten the survival of plants in some fields. Attempts were made to control the weeds using existing agricultural pesticide applicators with appropriate herbicides; however the wet conditions prevented timely application and thus effective control on some fields. CRC and ADS have since been working to resolve this issue and plan to have a tracked, low soil impact,

herbicide application system that will enable more timely herbicide application in place by the summer 2009 growing season.

S*tand Densities*

At dormancy, SUNY-ESF conducted field assessments to evaluate stands and individual variety growth, performance and vigor. Coppicing was started on fields where SUNY-ESF had finished their assessment.

*Records*

Complete records of all scouting observations, spray recommendations and spray applications are maintained

***Coppicing***

ADS has successfully coppiced approximately 110 acres as of the writing of this report and plans to continue coppicing through the spring until bud-break. Any remaining acres left after this season will be coppiced next fall and the spring of 2010.

**2008 Financials**

The total 2008 expenditures for the establishment of willow, land rent, cultivation, planting and maintenance was $665,460.00.

# Annual Work Plan FY 2009

The primary activities for 2009 are to coppice fields, continue to manage fields for weeds and pests and improve establishment where possible. The team will assess acreage for vitality and supervise for "fill-in" as required. We will conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, fertilization, data collection and yield projections.

A summary of specific efforts include:

- Walk fields with planting crew in March-April 2009 and re-plant as needed.
- Treat all fields with soil applied pre-emergent herbicides as soon as ground conditions allow for travel in the spring. The specific herbicides and rates used could vary from field to field depending upon weed species present and determinations of herbicides that are suitable for use (crop injury potential vs. efficacy on weeds)
- Apply additional amendments to increase soil pH. Either wood ash or ground limestone could be applied.
- Apply other nutrients to improve soil fertility (potassium and phosphorus). Either wood ash, organic waste products or commercial fertilizer could be applied.
- Monitor fields utilizing integrated pest management protocols. Treat fields with insect/disease out breaks and weed escapes as warranted.

In addition, the team is evaluating specialized equipment needs to perform the above tasks more costs effectively, including:

- Either ATV or small utility tractor which will provide the floatation to allow travel on very wet fields.
- Sprayer to attach to ATV to allow for herbicide applications in wet field conditions
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**Conclusion**

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**Going Forward**

- Coppice the fields yet to be coppiced and:
  - Apply additional lime as required
  - Apply herbicides as required
- Investigate nutrient application especially at West Branch
- Investigate harvesting technology in anticipation of harvest as early as 2013

**Conclusion**

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In addition a number of key learning have taken place concerning the best practices for the commercial propagation of hybrid willow over wide variety of sites, micro climates, and historical field conditions throughout the geography and soil types of New York State.

Going forward there is still a significant learning curve yet to overcome particularly concerning weed control, best tillage practices and the best harvesting technology.

# Progress Report 4th Quarter of 2009

## Executive Summary

No management activity occurred on the Southern plantations, Patterson and Edgewood, during the 4th quarter of 2009. Plans were in place to lime, coppice, and to perform weed control on the northern plantations as conditions dictated however, extremely wet fall field conditions hampered much of this effort. The low impact pesticide spray unit enabled the application of appropriate herbicides to West Branch, Bush, and Agens. The goal being more robust weed control as the 2010 growing season gets under way next spring. Efforts were made to coppice most of the remaining un-coppiced fields, but again due to the saturated field conditions, only portions of Bush and West Brach were successfully coppiced. The Headlands were mowed on all of the fields.

## Specific Management Activities

Herbicide Application

As noted in previous reports competition by undesirable weeds for site attributes, mainly sun and nutrients, has significantly hampered willow growth on several of the northern fields; Bush, Agens, West Branch, and two minor fields at Croniser.

Our planting partner, Ag Development Services, ADS, identified a herbicide, called Casoron, as a new treatment option, Casoron has several labeled attributes that cause it to have a great deal of potential as a weed treatment for willow; it is labeled for willow application, it kills a wide spectrum of the weeds found on our sites, and it can be applied after coppice in the fall. Various treatment rates and appropriate herbicide combinations where applied to determine the most effective combinations and rates for the weed issues encountered on our fields. Treatments will be monitored for effectiveness. It is worth noting that despite saturated field conditions, treatment was made possible due to the low impact applicator purchased specifically to apply herbicides, under such conditions, in the spring of 2009.

## Lime Application

Arrangements were made to apply additional lime on the West Branch fields to raise the soil PH and thereby increase site productivity, however excessively wet field conditions inhibited these efforts. The application is still planed when field and weather conditions permit.

## Coppicing

Coppicing was planned for most of the Uncoppiced feilds, including West Branch, Bush, two minor fields at Croniser and the Strip Till Trial. Saturated field conditions hampered coppicing efforts. Most of the fields at Bush's where successfully coppiced along small portion of the West Branch property. Coppicing efforts will continue through the winter and spring up to bud-

break as weather permits. Agens will not be coppiced as it has been decided to not sacrifice the significant growth that occurred during the 2009 growing season.

**Other Maintenance Activity**

The headlands, unplanted field margins, where mowed on all of the sites. Mowing the headlands maintains the aesthetics of the site, control weeds, and maintains plantation access.

**2010 Work Plan**

- Coppicing will continue on un-coppiced fields as weather permits until bud-break
- Lime will be applied on the West Branch property as weather permits
- Monitoring will be ongoing on existing fields
- Scheduled to plant a minimum of 200 acres and a maximum of 700 additional acres in 2010.
- Investigate low impact equipment to allow coppicing and nutrient application on wet sites.

**Conclusion**

Plantation maintenance scheduled for the 3rd quarter of 2009 was hindered by excessive field saturations. None of the scheduled activities where critical to plantation survival and will be performed during the 1st and 2nd quarters of 2010 as field conditions permit. Going forward Catalyst/ADS will continue to monitor field conditions and apply appropriate cultural treatments as dictated by observed conditions. In addition, Catalyst plans to plant an additional 200-700 acres of willow during the 2010 planting season.

CRC Development LLC

Special Status Report

For EERE: Project Management Center

**DE-FG3608GO88058**
**Project Title:** Closed Loop Short Rotation Woody Biomass Energy Crops
**Recipient:** CRC Development, LLC
**Status:** Active, contract in performance from award date to completion date.

**Budget Period:** 9/1/2008 - 10/31/2013

**Report**

For FY 2009 there is nothing to report. Everything per Project Management Plan.

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**Recipient Contact Information**

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**DOE Contact Information**

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**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient:**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston and Oneida Counties.**
**Reporting Period: January 1-March 31, 2010**
**Date of Report:** April 30, 2010
**Written by:** Jack Santamour

1. **Planned Activities**: As stated in the 4th Quarter 2009 report the activities planned for the first quarter of 2010 were:
    - Coppicing will continue on un-coppiced fields as weather permits until bud-break.
    - Lime will be applied on the West Branch property as weather permits.
    - Monitoring will be ongoing on existing fields.
    - Scheduled to plant a minimum of 200 acres and a maximum of 700 additional acres in 2010.
    - Investigate low impact equipment to allow coppicing and nutrient application on wet sites.

2. **Actual Accomplishments**:
    - Coppicing- No coppicing occurred in the 1st Qtr of 2010.
    - Lime- No Lime was applied in the 1st Qtr of 2010.
    - Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
    - New Planting- The following has been accomplished in regards to the 2010 planting effort:
        - 200 acres have been procured for planting through leases and partnerships with land owners.
        - Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
        - The cuttings are being processed.
        - Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
    - Low Impact Equipment- No progress has been made.

3. **Explanation of Variance**:

    - Coppicing- No coppicing occurred in the 1st Qtr of 2010 as planned due to excessive snow and or wet field conditions.
    - Lime- No Lime was applied in the 1st Qtr of 2010 as planned due to excessive snow fall and or wet field conditions.

- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:
    - 200 acres have been procured for planting through leases and partnerships with land owners.
    - Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
    - The cuttings are being processed.
    - Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
- Low Impact Equipment- No progress has been made since applications with power take off (PTO) capability are limited. We expect to make more progress as we increase acres and can justify specialized equipment.

4. **Plans for Next Quarter**:
    - Coppice remaining fields as weather and time permits prior to bud break.
    - Apply Lime to West Branch properties as weather permits.
    - Ongoing crop monitoring all fields.
    - Plant 200 additional acres
        - Cuttings have been ordered and the payments made.
        - Acreage has been procured.

**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: April 1-June 30, 2010**
**Date of Report: July 30, 2010**
**Written by: Jack Santamour**

1. **Planned Activities**: As stated in the 1st Quarter 2010 report the activities planned for the first quarter of 2010 were:
    - Coppice remaining fields as weather and time permits prior to bud break.
    - Apply Lime to West Branch properties as weather permits.
    - Ongoing crop monitoring all fields.
    - Plant 200 additional acres

2. **Actual Accomplishments**:
    - Coppicing- Coppiced 20 acres planted in the spring of 2009.
    - Lime- No Lime was applied in the 2nd Qtr of 2010.
    - Monitoring- Existing and newly planted fields were monitored throughout the 2nd quarter with 250 acres treated for weed control with the appropriate herbicides.
    - New Planting- The following was accomplished in the 2nd quarter of 2010:
        - 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
        - 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
        - Planted 10 Acres, New Road, Chautauqua Co, New York

3. **Explanation of Variance**:

    - Lime- No Lime was applied in the 2nd Qtr of 2010 as planned due to saturated field conditions.
    - Coppicing was limited due to wet field conditions throughout the spring.
    - New Planting- The following has been accomplished in regards to the 2010 planting effort:
        - Late spring rain hampered planting efforts. If weather permits we plan to finish available acres.
            - 30 Acres Walczyk Farm
            - 10 Acres New Road
            - 13 Acres Edgewood

4. **Plans for 3rd Quarter 2010**:

    - Evaluate West Branch properties to determine if lime can yet be applied without excessive crop damage. If it is determined that lime can be applied we will do so as weather permits.
    - Ongoing crop monitoring on all fields.
    - Finish planting available acres:
        - 30 Acres Walczyk Farm
        - 10 Acres New Road
        - 13 Acres Edgewood

**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: October-December 2010**
**Date of Report: January 28, 2010**
**Written by: Jack Santamour**

1. **Planned Activities**:

    - Coppice 2010 planting in 4th qrt of 2010 or 1st qrt of 2011

2. **Actual Accomplishments**:

    - No coppicing was accomplished.
    - Herbicide treatments as required to control weeds.
    - Inspected fields with Dr. Larry Smart, Cornell University and Alistair McCraken, Agri-Food &Bioscience Institute, Belfast, United Kingdom

3. **Explanation of Variance**:

    - Unfavorable weather conditions prevented coppicing during the last quarter of 2010.

4. **Plans for 1st Quarter 2011**:

    - Coppice 2010 planting in the 1st qrt of 2011

5. **Cumulative Accomplishments**:

    2008

    - Rented 600 acres of underutilized agricultural land.
    - Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:
        i. Mowing fields with a brush hog
        ii. Herbicide Treatment
        iii. Lyme application
        iv. Plowed using a mold bar plow
        v. Rocks picked
        vi. Final Disking
        vii. Planted with a step planter at the rate of 6500 clones per acre
    - Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.

- Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis
- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

2009

- The plantations located in Southern, NY (South of NY 90) where coppiced in the 1st qrt.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a "strip-till" tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during the 4th qrt.

2010- 1st Qrt

- Coppicing- No coppicing occurred in the 1st Qtr of 2010.
- Lime- No Lime was applied in the 1st Qtr of 2010.
- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:
    i. 200 acres have been procured for planting through leases and partnerships with land owners.
    ii. Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
    iii. The cuttings are being processed.
    iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
- Low Impact Equipment- No progress has been made.

2010- 2nd Qrt

- Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied in the 2nd Qtr of 2010.
- Monitoring- Existing and newly planted fields were monitored throughout the 2nd quarter with 250 acres treated for weed control with the appropriate herbicides.

- New Planting- The following was accomplished in the 2nd quarter of 2010:
    - 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
    - 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
    - Planted 10 Acres, New Road, Chautauqua Co, New York

2010-3rd Qrt

- Lyme was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
    - 30 Acres Walczyk Farm
    - 10 Acres New Road, Chautauqua Co.
    - 13 Acres Edgewood

**Patents:** N/A

**Publications / Presentations:** N/A

## Other Reports

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number: G088058**

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: January-December 2010**
**Date of Report: January 31, 2011**
**Written by: Michael R. Brower**

**Nothing additional to report**

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: October-December 2010**
**Date of Report: January 28, 2010**
**Written by: Jack Santamour**

1. **Planned Activities**:

    - Coppice 2010 planting in reporting period October –December 2010 or January-March of 2011

2. **Actual Accomplishments**:

    - No coppicing was accomplished.
    - Herbicide treatments as required to control weeds.
    - Inspected fields with Dr. Larry Smart, Cornell University and Alistair McCraken, Agri-Food &Bioscience Institute, Belfast, United Kingdom

3. **Explanation of Variance**:

    - Unfavorable weather conditions prevented coppicing from October – December 2010.

4. **Plans for January-March 2011**:

    - Coppice 2010 planting.

5. **Cumulative Accomplishments**:

    2008

    - Rented 600 acres of underutilized agricultural land.
    - Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:
        i. Mowing fields with a brush hog
        ii. Herbicide Treatment
        iii. Lyme application
        iv. Plowed using a mold bar plow
        v. Rocks picked
        vi. Final Disking
        vii. Planted with a step planter at the rate of 6500 clones per acre

- Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.
- Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis
- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

2009

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.

2010- January-March

- Coppicing- No coppicing occurred from January-March 2010.
- Lime- No Lime was applied during reporting period January-March 2010.
- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:
    i. 200 acres have been procured for planting through leases and partnerships with land owners.
    ii. Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
    iii. The cuttings are being processed.
    iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
- Low Impact Equipment- No progress has been made.

2010- April-June

- Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied from April-June 2010.

- Monitoring- Existing and newly planted fields were monitored throughout the April-June reporting period with 250 acres treated for weed control with the appropriate herbicides.

- New Planting- The following was accomplished in the April-June, 2010 reporting period:
    - 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
    - 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
    - Planted 10 Acres, New Road, Chautauqua Co, New York

2010-July-September

- Lyme was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
    - 30 Acres Walczyk Farm
    - 10 Acres New Road, Chautauqua Co.
    - 13 Acres Edgewood

**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: January-March 2011**
**Date of Report:** April 8, 2011
**Written by:** Derek Benson

- **Planned Activities**:
    - Coppice 2010 planting in reporting period January-March of 2011
- **Actual Accomplishments**:
    - No coppicing was accomplished
- **Explanation of Variance**:
    - Weather conditions not favorable for coppicing due to harsh winter conditions
- **Plans for April- June 2011**:
    - Coppice 2010 planting
    - Ongoing crop inspection and monitoring
    - Treat weeds as required
- **Cumulative Accomplishments**:

    2008
    - Rented 600 acres of underutilized agricultural land.
    - Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:
        i. Mowing fields with a brush hog
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- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

2009

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.

2010- January-March

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    iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
- Low Impact Equipment- No progress has been made.

2010- April-June

- Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied from April-June 2010.
- Monitoring- Existing and newly planted fields were monitored throughout the April-June reporting period with 250 acres treated for weed control with the appropriate herbicides.

- New Planting- The following was accomplished in the April-June, 2010 reporting period:

- 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
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**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
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**Reporting Period: January-March 2011**
**Date of Report:** April 8, 2011
**Written by:** Derek Benson

- **Planned Activities**:
    - Coppice 2010 planting in reporting period January-March of 2011
- **Actual Accomplishments**:
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- **Explanation of Variance**:
    - Weather conditions not favorable for coppicing due to harsh winter conditions
- **Plans for April- June 2011**:
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    - Ongoing crop inspection and monitoring
    - Treat weeds as required
- **Cumulative Accomplishments**:

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2010- January-March

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- Lime- No Lime was applied from April-June 2010.
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- Planted 10 Acres, New Road, Chautauqua Co, New York

2010-July-September

- Lyme was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
  - 30 Acres Walczyk Farm
  - 10 Acres New Road, Chautauqua Co.
  - 13 Acres Edgewood

**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**

**Project Title: CLOSED LOOP SHORT ROTATION WOODY BIOMASS ENERGY CROPS**

**Award Number:** G088058

**Recipient: Catalyst Renewables**
**Project Location: Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties.**
**Reporting Period: April-June 2011**
**Date of Report:** July 7, 2011
**Written by:** Derek Benson

- **Planned Activities**:
    - Continue to observe planting growth and insect and weed competition
- **Actual Accomplishments**:
    - Planting growth and insect and weed competition observations were made
- **Explanation of Variance**:
    - N/A
- **Plans for July- September 2011**:
    - Ongoing crop inspection and monitoring
    - Treat weeds as required
- **Cumulative Accomplishments**:

    2008
    - Rented 600 acres of underutilized agricultural land.
    - Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:
        i. Mowing fields with a brush hog
        ii. Herbicide Treatment
        iii. Lyme application
        iv. Plowed using a mold bar plow
        v. Rocks picked
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    - Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.
    - Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis.
    - Weed control was preformed as conditions warranted.

- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

2009

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
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- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.

2010- January-March

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- Lime- No Lime was applied during reporting period January-March 2010.
- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:
    i. 200 acres have been procured for planting through leases and partnerships with land owners.
    ii. Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
    iii. The cuttings are being processed.
    iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.
- Low Impact Equipment- No progress has been made.

2010- April-June

- Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied from April-June 2010.
- Monitoring- Existing and newly planted fields were monitored throughout the April-June reporting period with 250 acres treated for weed control with the appropriate herbicides.

- New Planting- The following was accomplished in the April-June, 2010 reporting period:

- 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
- 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
- Planted 10 Acres, New Road, Chautauqua Co, New York

2010-July-September

- Lyme was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
  - 30 Acres Walczyk Farm
  - 10 Acres New Road, Chautauqua Co.
  - 13 Acres Edgewood

**Patents:** N/A

**Publications / Presentations:** N/A

**Quarterly Progress Report**
**(Field Office Project Template)**

**Project Title:** Closed Loop Short Rotation Woody Crops
**Award Number:** GO088058

**Recipient:** CRC Development
**Project Location:** Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties
**Reporting Period:** April 1, 20111 to June 30, 2011
**Date of Report** Amendment September 1, 2011
**Written by:** Derek Benson

**Status**:
**Task number: M-5. Willow Plantation Creation**

**1. Planned Activities**: Natural agricultural progression and development underway. Management and observation of planting growth and insect/weed competition underway

**2. Actual Accomplishments**: Conducted management and observation of planting growth and insect/weed competition. Treated weeds and insects as required.

**3. Explanation of Variance**: No variances to report.

4.**Plans for Next Quarter**: Continue management and observation of plant growth and insect/weed competition. Treat weeds and insects as required.

6. **Patents:** None

7. **Publications / Presentations:** None

**Quarterly Progress Report**
**(Field Office Project Template)**

**Project Title:** Closed Loop Short Rotation Woody Crops
**Award Number:** GO088058

**Recipient:** CRC Development
**Project Location:** Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties
**Reporting Period**: July, 1 2011-September 30, 2011
**Date of Report** : October 30, 2011
**Written by:** Michael R. Brower

**Status**:
**Task number: M-5. Willow Plantation Creation**

**1. Planned Activities**: Natural agricultural progression and development underway. Management and observation of planting growth and insect/weed competition underway

**2. Actual Accomplishments**: Conducted management and observation of planting growth and insect/weed competition. Treated weeds and insects as required.

**3. Explanation of Variance**: No variances to report.

4.**Plans for Next Quarter**: Continue management and observation of plant growth and insect/weed competition. Treat weeds and insects as required.

6. **Patents:** None

7. **Publications / Presentations:** None

**Quarterly Progress Report**
**(Field Office Project Template)**

**Project Title:** Closed Loop Short Rotation Woody Crops
**Award Number:** GO088058

**Recipient:** CRC Development
**Project Location:** Plantations in New York in Lewis, Oneida, Livingston, Jefferson, Chautauqua and Cayuga Counties
**Reporting Period**: October 1, 2011-December 31, 2011
**Date of Report** : January 30,, 2012
**Written by:** Michael R. Brower

**Status**:
**Task number: M-5. Willow Plantation Creation**

**1. Planned Activities**: Natural agricultural progression and development underway. Management and observation of planting growth and insect/weed competition underway

**2. Actual Accomplishments**: Conducted management and observation of planting growth and insect/weed competition. Treated weeds and insects as required.

**3. Explanation of Variance**: No variances to report.

4.**Plans for Next Quarter**: Continue management and observation of plant growth and insect/weed competition. Treat weeds and insects as required.

6. **Patents:** None

7. **Publications / Presentations:** None

# Research Performance Progress Report (RPPR)
# 01/30/12

Federal Agency and Organization Element to Which Report is Submitted-USDOE Golden Field Office

Federal Grant or Other Identifying Number Assigned by Agency-DE-FG36-08GO88058

Project Title-Closed Loop Short Rotation Woody Biomass Energy Crops

PD/PI Name, Title and Contact Information - Business Contact: Michael R. Brower, Phone: 315-425-2839, mbrower@mosaicllc.com.Technical Contact: Carol Thimot, Phone: 214-880-3499,carolt@catalystRC.com

Name of Submitting Official, Title, and Contact Information (e-mail address and phone number), if other than PD/PI-Michael R. Brower

Submission Date -03/03/2012

DUNS Number-80-135-7547

Recipient Organization (Name and Address)- CRC Development, LLC, 2602 McKinney Avenue, Suite 200, Dallas, TX 75204

Project/Grant Period (Start Date, End Date) 01/04/2008-04/04/2013 (No Cost Extension Due USDOE Funding Release Delay)

Reporting Period End Date 12/31/2011

Report Term or Frequency (annual, semi-annual, quarterly, other)-Annual

Signature of Submitting Official (electronic signatures (i.e., Adobe Acrobat) are acceptable) **Michael R. Brower**

**ACCOMPLISHMENTS:** Monitoring and cultivation of installed commercial Closed Loop Short Rotation Woody Biomass Energy Crops. Crop is thriving.

What are the major goals and objectives of the project? Grow Closed Loop Short Rotation Woody Biomass Energy Crops

What was accomplished under these goals? Crop was installed, is growing and is maturing.

- Rented 600 acres of underutilized agricultural land.
- Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:

i. Mowing fields with a brush hog
ii. Herbicide Treatment
iii. Lyme application
iv. Plowed using a mold bar plow
v. Rocks picked
vi. Final Disking
vii. Planted with a step planter at the rate of 6500 clones per acre

- Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.
- Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis.
- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.
- Coppicing- No coppicing occurred from January-March 2010.
- Lime- No Lime was applied during reporting period January-March 2010.
- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:

i. 200 acres have been procured for planting through leases and partnerships with land owners.
ii. Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
iii. The cuttings are being processed.
iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.

- Low Impact Equipment- No progress has been made.
  Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied from April-June 2010.
- Monitoring- Existing and newly planted fields were monitored throughout the April-June reporting period with 250 acres treated for weed control with the appropriate herbicides.
- New Planting- The following was accomplished in the April-June, 2010 reporting period:
  - ☐ 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
  - ☐ 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
    - Planted 10 Acres, New Road, Chautauqua Co, New York
- Lime was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
  - ☐ 30 Acres Walczyk Farm
  - ☐ 10 Acres New Road, Chautauqua Co.
  - ☐ 13 Acres Edgewood

What opportunities for training and professional development has the project provided? Commercial installation (planting) experience, mechanized planting, weed control techniques.

How have the results been disseminated to communities of interest? Project is still in progress.

What do you plan to do during the next reporting period to accomplish the goals and objectives? Continue monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

**What are the major goals of the project?** Install and grow commercial Monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

List the major goals of the project as stated in the approved application or as approved by the agency. If the application lists milestones/target dates for important activities or phases of the project, identify these dates and show actual completion dates or the percentage of completion. Generally, the goals will not change from one reporting period to the next. However, if the awarding agency approved changes to the goals during the reporting period, list the revised goals and objectives. Also explain any significant changes in approach or methods from the agency

approved application or plan.

The goal of Closed Loop Short Rotation Woody Biomass Energy Crops is supply expansion in Central New York to facilitate the commercialization of willow biomass crops as part of the mix of woody biomass feedstocks for bioenergy and bioproducts. CRC LLC established the first commercial willow biomass plantation acreage in North America was established on the Tug Hill in the spring of 2006 and expanded in 2007 and 2008. This was the first 500- acres toward the goal of 10,000 regional acres. The 2009 season scope of work includes coppice, interplant, and maintain plantations.

This project replaces some 2008-missed acreage and installs a total of 20-acre new density planting acres in order to demonstrate to regional agricultural producers and rural land-owners the economic vitality of closed loop short rotation woody biomass energy crops when deployed commercially in order to motivate new grower entry into the market-place. The willow biomass will directly help stabilize the fuel supply for the Lyonsdale Biomass facility, which produces 19 MWe of power and exports 15,000 pph of process steam to Burrows Paper. This project will also provide feedstock to The Biorefinery in New York for the manufacture of renewable, CO2-neutral liquid transportation fuels, chemicals and polymers. This project helps end dependency on imported fossil fuels, adds to region economic and environmental vitality and contributes to national security through improved energy independence.

The Energy Policy Act 2005 Section 931(c) directed USDOE to conduct research and development on biomass, bioenergy and bioproducts. The USDOE Biomass Office and the Golden Field Office are at the forefront of these efforts. This project will validate and codify commercial installation, cultivation and harvest procedures. The project will establish commercial economic baselines and associated yield rates and because a market is ready-made at Lyonsdale Biomass farm-gate to power, thermal energy, and bio-chemical and thermo-chemical products manufacture economics will cease to be academic models and find a basis in the efficiencies of the market-place. Installation of 1,000 acres by Summer 2010 will be the largest scale commercial demonstration in North America for closed loop short rotation woody biomass energy crops and will set the non-academic benchmark for commercialization.

**Interplant Willow Clones-** CRC will plant 400,000+ cuttings for the purpose of improving stand density and enhancing commercial viability of the stands.

**Conduct Commercial Agriculture Management & Cultural Practices**

Integrated pest management and field scouting

Hydration and fertilization

Data collection and yield projections

Coppice the established 506-acres-Spring 2009/Fall 2009/Spring 2010 depending on plant vitality. Estimate 235-acres complete by July 2009.

**Prepare 500-new acres for Installation**

**500-Acres To Be Secured** - Facilitate numerous leases. Meet with land owners to evaluate land for potential willow production. Landowner contacts via public meetings, newspaper advertising, word of mouth, business calls and third party referrals. Factors being evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate.

**Pre-Post Emergence Weed Control-**As required plow, disk and drag identified plantation acreage. Conduct typically approved agricultural practices for commercial pre-post emergence weed control weed control on the prepared plantation acreage.

- Fields mowed with a brush hog to mechanically remove brush and tall grass.
- As required, the fields treated with herbicide in order to kill all competing vegetation.
- Lime applied as required in order to increase the ph of the soils.
- Fields plowed using a mold bar plow in order to turn soils completely over if the fields have been long idle.
- Rocks picked from the fields using hand labor.
- Fields disked to fracture the soil sufficiently to ensure cutting development.

**Plant closed loop short rotation woody biomass energy crop clones –** Demonstrate zone till cultivation methods to reduce site preparation costs and achieve environmental and energy life-cycle enhancements. A 20-acre test stand prepared and planted using these techniques. Install on average 6600 planting whips per acre using commercial equipment and typical commercial crews.

**Energy Crop Development & Application**

**Coppice all remaining 2009 closed loop short rotation woody biomass energy plantation plantings-** One year after planting, conduct wide-scale 100% coppice of all 2008 installations. Assess acreage for vitality; supervise for "fill-in" as required. Fertilize as appropriate.

**Cultivate and Manage all 2009 closed loop short rotation woody biomass energy plantation plantings-**Conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, data collection and yield projections.

**Harvest and Transport all 2009 closed loop short rotation woody biomass energy plantation plantings-** End of fourth year, conduct total commercial harvest using both stem and chipper harvester units. Ship to appropriate facilities for conversion to energy.

**Project Management and Reporting –**Provide end-to-end commercial oversight and management of every project aspect. Collect appropriate data to provide reports and other deliverables will be provided in accordance with the Federal Assistance Reporting Checklist following the instructions included therein.

**What do you plan to do during the next reporting period to accomplish the goals?**
Describe briefly what you plan to do during the next reporting period to accomplish the goals and objectives. Harvest the crop, given the availability of appropriate harvest technology.

# Research Performance Progress Report (RPPR)
# 03/30/12

Federal Agency and Organization Element to Which Report is Submitted-USDOE Golden Field Office

Federal Grant or Other Identifying Number Assigned by Agency-DE-FG36-08GO88058

Project Title-Closed Loop Short Rotation Woody Biomass Energy Crops

PD/PI Name, Title and Contact Information - Business Contact: Michael R. Brower, Phone: 315-425-2839, mbrower@mosaicllc.com.Technical Contact: Carol Thimot, Phone: 214-880-3499,carolt@catalystRC.com

Name of Submitting Official, Title, and Contact Information (e-mail address and phone number), if other than PD/PI-Michael R. Brower

Submission Date -05/08/2012

DUNS Number-80-135-7547

Recipient Organization (Name and Address)- CRC Development, LLC, 2602 McKinney Avenue, Suite 200, Dallas, TX 75204

Project/Grant Period (Start Date, End Date) 01/04/2008-04/04/2013 (No Cost Extension Due USDOE Funding Release Delay)

Reporting Period End Date 03/30/2012

Report Term or Frequency (annual, semi-annual, quarterly, other)-Quarterly

Signature of Submitting Official (electronic signatures (i.e., Adobe Acrobat) are acceptable) **Michael R. Brower**

**ACCOMPLISHMENTS:** Monitoring and cultivation of installed commercial Closed Loop Short Rotation Woody Biomass Energy Crops. Crop is thriving.

What are the major goals and objectives of the project? Grow Closed Loop Short Rotation Woody Biomass Energy Crops

What was accomplished under these goals? Crop was installed, is growing and is maturing.

- Rented 600 acres of underutilized agricultural land.
- Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:

i. Mowing fields with a brush hog
ii. Herbicide Treatment
iii. Lyme application
iv. Plowed using a mold bar plow
v. Rocks picked
vi. Final Disking
vii. Planted with a step planter at the rate of 6500 clones per acre

- Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.
- Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis.
- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.
- Coppicing- No coppicing occurred from January-March 2010.
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- New Planting- The following has been accomplished in regards to the 2010 planting effort:

i. 200 acres have been procured for planting through leases and partnerships with land owners.
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- Low Impact Equipment- No progress has been made.
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- Finished planting available acres:
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  - ☐ 10 Acres New Road, Chautauqua Co.
  - ☐ 13 Acres Edgewood

What opportunities for training and professional development has the project provided? Commercial installation (planting) experience, mechanized planting, weed control techniques.

How have the results been disseminated to communities of interest? Project is still in progress.

What do you plan to do during the next reporting period to accomplish the goals and objectives? Continue monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

**What are the major goals of the project?** Install and grow commercial Monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

List the major goals of the project as stated in the approved application or as approved by the agency. If the application lists milestones/target dates for important activities or phases of the project, identify these dates and show actual completion dates or the percentage of completion. Generally, the goals will not change from one reporting period to the next. However, if the awarding agency approved changes to the goals during the reporting period, list the revised goals and objectives. Also explain any significant changes in approach or methods from the agency

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**Interplant Willow Clones-** CRC will plant 400,000+ cuttings for the purpose of improving stand density and enhancing commercial viability of the stands.

**Conduct Commercial Agriculture Management & Cultural Practices**

Integrated pest management and field scouting

Hydration and fertilization

Data collection and yield projections

Coppice the established 506-acres-Spring 2009/Fall 2009/Spring 2010 depending on plant vitality. Estimate 235-acres complete by July 2009.

**Prepare 500-new acres for Installation**

**500-Acres To Be Secured** - Facilitate numerous leases. Meet with land owners to evaluate land for potential willow production. Landowner contacts via public meetings, newspaper advertising, word of mouth, business calls and third party referrals. Factors being evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate.

**Pre-Post Emergence Weed Control-**As required plow, disk and drag identified plantation acreage. Conduct typically approved agricultural practices for commercial pre-post emergence weed control weed control on the prepared plantation acreage.

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**Energy Crop Development & Application**

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**Harvest and Transport all 2009 closed loop short rotation woody biomass energy plantation plantings-** End of fourth year, conduct total commercial harvest using both stem and chipper harvester units. Ship to appropriate facilities for conversion to energy.

**Project Management and Reporting –**Provide end-to-end commercial oversight and management of every project aspect. Collect appropriate data to provide reports and other deliverables will be provided in accordance with the Federal Assistance Reporting Checklist following the instructions included therein.

**What do you plan to do during the next reporting period to accomplish the goals?**
Describe briefly what you plan to do during the next reporting period to accomplish the goals and objectives. Continue to harvest the crop, given the availability of appropriate harvest technology.

# Research Performance Progress Report (RPPR)
# 06/30/12

Federal Agency and Organization Element to Which Report is Submitted-USDOE Golden Field Office

Federal Grant or Other Identifying Number Assigned by Agency-DE-FG36-08GO88058

Project Title-Closed Loop Short Rotation Woody Biomass Energy Crops

PD/PI Name, Title and Contact Information - Business Contact: Michael R. Brower, Phone: 315-425-2839, mbrower@mosaicllc.com.Technical Contact: Carol Thimot, Phone: 214-880-3499,carolt@catalystRC.com

Name of Submitting Official, Title, and Contact Information (e-mail address and phone number), if other than PD/PI-Michael R. Brower

Submission Date -05/08/2012

DUNS Number-80-135-7547

Recipient Organization (Name and Address)- CRC Development, LLC, 2602 McKinney Avenue, Suite 200, Dallas, TX 75204

Project/Grant Period (Start Date, End Date) 01/04/2008-04/04/2013 (No Cost Extension Due USDOE Funding Release Delay)

Reporting Period End Date 03/30/2012

Report Term or Frequency (annual, semi-annual, quarterly, other)-Quarterly

Signature of Submitting Official (electronic signatures (i.e., Adobe Acrobat) are acceptable) **Michael R. Brower**

**ACCOMPLISHMENTS:** Monitoring and cultivation of installed commercial Closed Loop Short Rotation Woody Biomass Energy Crops. Crop is thriving.

What are the major goals and objectives of the project? Grow Closed Loop Short Rotation Woody Biomass Energy Crops

What was accomplished under these goals? Crop was installed, is growing and is maturing.

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- Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:

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  - ☐ 10 Acres New Road, Chautauqua Co.
  - ☐ 13 Acres Edgewood

What opportunities for training and professional development has the project provided? Commercial installation (planting) experience, mechanized planting, weed control techniques.

How have the results been disseminated to communities of interest? Project is still in progress.

What do you plan to do during the next reporting period to accomplish the goals and objectives? Continue monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

**What are the major goals of the project?** Install and grow commercial Monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

List the major goals of the project as stated in the approved application or as approved by the agency. If the application lists milestones/target dates for important activities or phases of the project, identify these dates and show actual completion dates or the percentage of completion. Generally, the goals will not change from one reporting period to the next. However, if the awarding agency approved changes to the goals during the reporting period, list the revised goals and objectives. Also explain any significant changes in approach or methods from the agency

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This project replaces some 2008-missed acreage and installs a total of 20-acre new density planting acres in order to demonstrate to regional agricultural producers and rural land-owners the economic vitality of closed loop short rotation woody biomass energy crops when deployed commercially in order to motivate new grower entry into the market-place. The willow biomass will directly help stabilize the fuel supply for the Lyonsdale Biomass facility, which produces 19 MWe of power and exports 15,000 pph of process steam to Burrows Paper. This project will also provide feedstock to The Biorefinery in New York for the manufacture of renewable, CO2-neutral liquid transportation fuels, chemicals and polymers. This project helps end dependency on imported fossil fuels, adds to region economic and environmental vitality and contributes to national security through improved energy independence.

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Hydration and fertilization

Data collection and yield projections

Coppice the established 506-acres-Spring 2009/Fall 2009/Spring 2010 depending on plant vitality. Estimate 235-acres complete by July 2009.

**Prepare 500-new acres for Installation**

**500-Acres To Be Secured** - Facilitate numerous leases. Meet with land owners to evaluate land for potential willow production. Landowner contacts via public meetings, newspaper advertising, word of mouth, business calls and third party referrals. Factors being evaluated included: acreage, soil type and quality, drainage, field history, slope, proximity to other willow acreage, proximity to the plant, and rental rate.

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- Fields mowed with a brush hog to mechanically remove brush and tall grass.
- As required, the fields treated with herbicide in order to kill all competing vegetation.
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**Plant closed loop short rotation woody biomass energy crop clones –** Demonstrate zone till cultivation methods to reduce site preparation costs and achieve environmental and energy life-cycle enhancements. A 20-acre test stand prepared and planted using these techniques. Install on average 6600 planting whips per acre using commercial equipment and typical commercial crews.

**Energy Crop Development & Application**

**Coppice all remaining 2009 closed loop short rotation woody biomass energy plantation plantings-** One year after planting, conduct wide-scale 100% coppice of all 2008 installations. Assess acreage for vitality; supervise for "fill-in" as required. Fertilize as appropriate.

**Cultivate and Manage all 2009 closed loop short rotation woody biomass energy plantation plantings-**Conduct typical commercial agriculture cultural practices including integrated pest management, field scouting, hydration, data collection and yield projections.

**Harvest and Transport all 2009 closed loop short rotation woody biomass energy plantation plantings-** End of fourth year, conduct total commercial harvest using both stem and chipper harvester units. Ship to appropriate facilities for conversion to energy.

**Project Management and Reporting –**Provide end-to-end commercial oversight and management of every project aspect. Collect appropriate data to provide reports and other deliverables will be provided in accordance with the Federal Assistance Reporting Checklist following the instructions included therein.

**What do you plan to do during the next reporting period to accomplish the goals?**
Describe briefly what you plan to do during the next reporting period to accomplish the goals and objectives. Continue to harvest the crop, given the availability of appropriate harvest technology.

# Research Performance Progress Report (RPPR)
# 09/30/12

Federal Agency and Organization Element to Which Report is Submitted-USDOE Golden Field Office

Federal Grant or Other Identifying Number Assigned by Agency-DE-FG36-08GO88058

Project Title-Closed Loop Short Rotation Woody Biomass Energy Crops

PD/PI Name, Title and Contact Information - Business Contact: Michael R. Brower, Phone: 315-425-2839, mbrower@mosaicllc.com.Technical Contact: Carol Thimot, Phone: 214-880-3499,carolt@catalystRC.com

Name of Submitting Official, Title, and Contact Information (e-mail address and phone number), if other than PD/PI-Michael R. Brower

Submission Date -05/08/2012

DUNS Number-80-135-7547

Recipient Organization (Name and Address)- CRC Development, LLC, 2602 McKinney Avenue, Suite 200, Dallas, TX 75204

Project/Grant Period (Start Date, End Date) 01/04/2008-04/04/2013 (No Cost Extension Due USDOE Funding Release Delay)

Reporting Period End Date 03/30/2012

Report Term or Frequency (annual, semi-annual, quarterly, other)-Quarterly

Signature of Submitting Official (electronic signatures (i.e., Adobe Acrobat) are acceptable) **Michael R. Brower**

**ACCOMPLISHMENTS:** Monitoring and cultivation of installed commercial Closed Loop Short Rotation Woody Biomass Energy Crops. Crop is thriving.

What are the major goals and objectives of the project? Grow Closed Loop Short Rotation Woody Biomass Energy Crops

What was accomplished under these goals? Crop was installed, is growing and is maturing.

- Rented 600 acres of underutilized agricultural land.
- Planted 427.5 acres of short rotation hybrid willow using established planting protocols including:

i. Mowing fields with a brush hog
ii. Herbicide Treatment
iii. Lyme application
iv. Plowed using a mold bar plow
v. Rocks picked
vi. Final Disking
vii. Planted with a step planter at the rate of 6500 clones per acre

- Initial surveys conducted by SUNY College of Environmental Science and Forestry determined an average establishment rate of 5000 cuttings per acre.
- Fields where scouted by a professional agronomist, SUNY ESF Staff, Catalyst Staff, and Dr John Gilliland, Rural Generations, on a regular basis.
- Weed control was preformed as conditions warranted.
- Due to higher than anticipated weed pressure stand density significantly declined by the end of the first growing season.
- Created a comprehensive cutting specification to improve planting efficiency and increase survivability.
- Created a field level mapping and management activity records data base.

- The plantations located in Southern, NY (South of NY 90) where coppiced in reporting period January-March.
- Fields planted in 2008 where inter-planted as needed to increase plant populations to desired levels
- Pre-emergent herbicides where applied to coppiced fields
- Worked with a local pesticide applicator to purchase a tracked application machine that could be used on saturated soils.
- Planted another 20 acres using a “strip-till” tillage method as a trial
- Approximately 100 acres of the Northern plantations where coppiced during reporting period October-December, 2010.
- Coppicing- No coppicing occurred from January-March 2010.
- Lime- No Lime was applied during reporting period January-March 2010.
- Monitoring- Fields were monitored throughout the winter with no adverse findings noted.
- New Planting- The following has been accomplished in regards to the 2010 planting effort:

i. 200 acres have been procured for planting through leases and partnerships with land owners.
ii. Sufficient cuttings to plant 200 acres have been ordered, deposits and payments made.
iii. The cuttings are being processed.
iv. Arrangements have been made for Ag Development Services to conduct field operations starting in April 2010 as weather permits.

- Low Impact Equipment- No progress has been made.
  Coppicing- Coppiced 20 acres planted in the spring of 2009.
- Lime- No Lime was applied from April-June 2010.
- Monitoring- Existing and newly planted fields were monitored throughout the April-June reporting period with 250 acres treated for weed control with the appropriate herbicides.
- New Planting- The following was accomplished in the April-June, 2010 reporting period:
  - ☐ 67 acres were planted in Jefferson County near Cape Vincent, New York in partnership with the landowner Celtic Energy Farms.
  - ☐ 75 acres were planted on a new farm in Cayuga County, near Auburn, New York on a new Farm called Walczyk Farm.
    - Planted 10 Acres, New Road, Chautauqua Co, New York
- Lime was not applied as it was determined that it would be easier, and more cost effective to apply after the 1st harvest scheduled for the fall of 2013 or 14
- Continued crop monitoring including inspecting plantations with two internationally known experts Dr. John Gilliland and Malcolm Dawson both form Northern Ireland.
- Finished planting available acres:
  - ☐ 30 Acres Walczyk Farm
  - ☐ 10 Acres New Road, Chautauqua Co.
  - ☐ 13 Acres Edgewood

What opportunities for training and professional development has the project provided? Commercial installation (planting) experience, mechanized planting, weed control techniques.

How have the results been disseminated to communities of interest? Project is still in progress.

What do you plan to do during the next reporting period to accomplish the goals and objectives? Continue monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

**What are the major goals of the project?** Install and grow commercial Monitoring and cultivation of installed Closed Loop Short Rotation Woody Biomass Energy Crops.

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